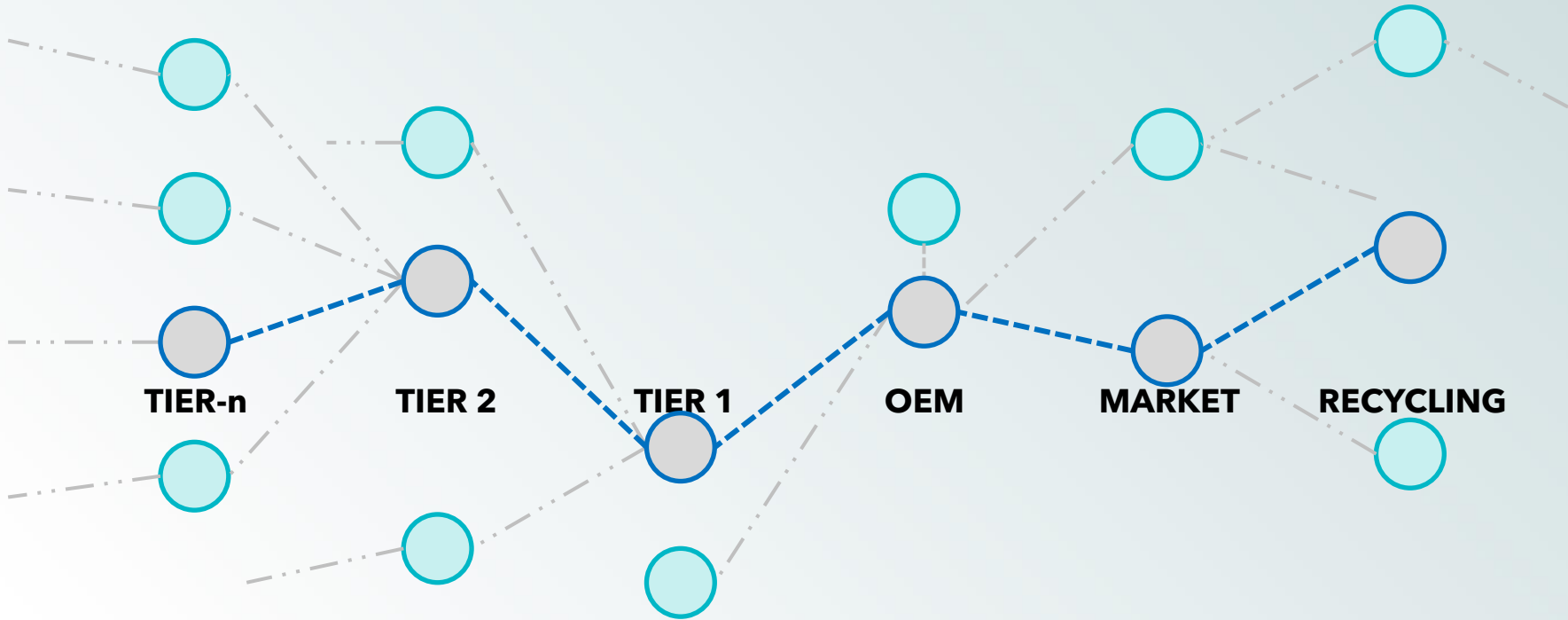


# Keiretsu and the automotive added-value chain

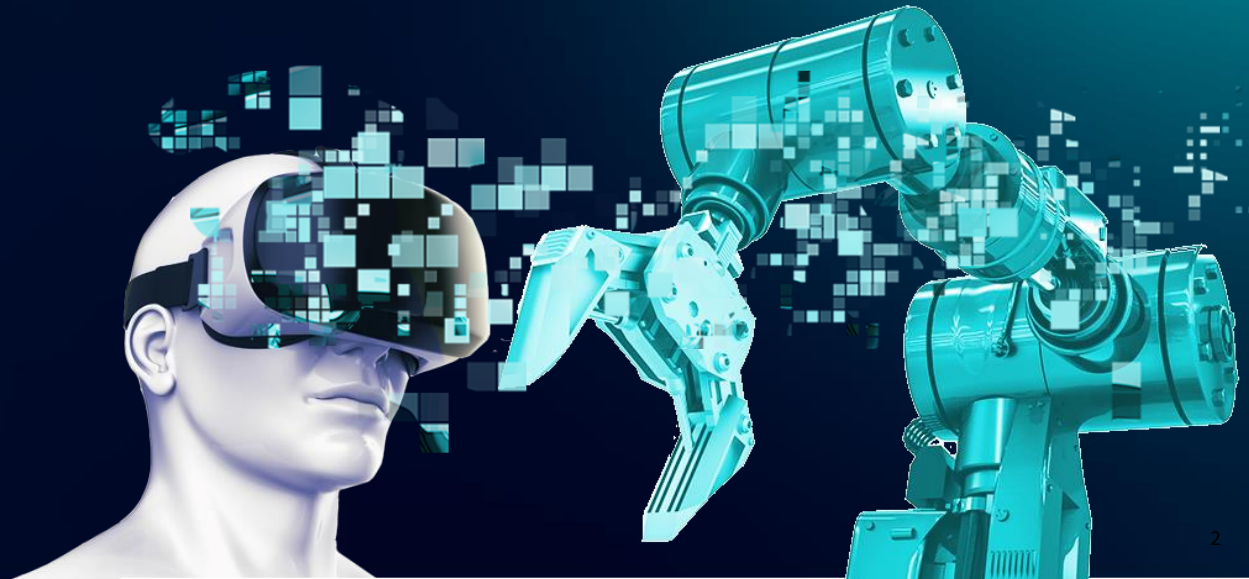


Different conventions, namings, systems, formats, policies, constraints, ...

# The future of collaborative engineering towards software-defined products

Dr. Alain Pfouga

prostep ivip Association



Data  
**(Sender)**



Data  
**(Recipient)**



Varying terminologies  
Incompatible tools  
Different data structure  
Disparate methods

Grown silos hinder collaboration across the distributed manufacturing value chain

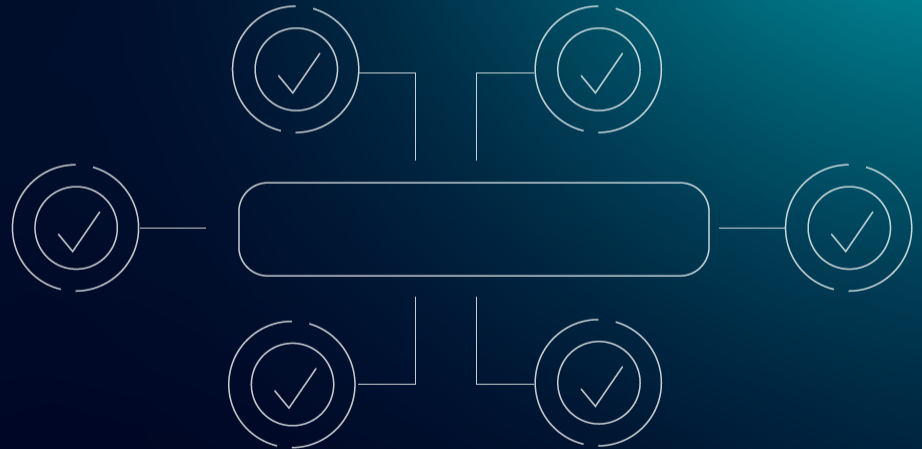
# Standardization Strategy

The business's digitalization goals require solutions and tool chains that are stable and effective.

**Engineering IT must enforce standards to reduce data transaction costs and increase efficiency for digital collaboration**

## FACTS

- 300+ project partners from Industry and IT
- Creating „Awareness“ for engineering IT standards and their crucial role for a seamless digitalization
- Empowering employees especially in a multilateral supply chain





# Industrial Digital Transformation

# Key drivers of transformation

**CO<sub>2</sub> / Ecological  
Footprint**



**Digitalization**



**Future markets  
and customer  
needs**



**People and Skills**



# New business paradigms require new development processes

VARIABILITY OF THE OBJECTIVES  
TIME2MARKET vs. MATURITY vs. QUALITY

CO<sub>2</sub> / Ecological Footprint

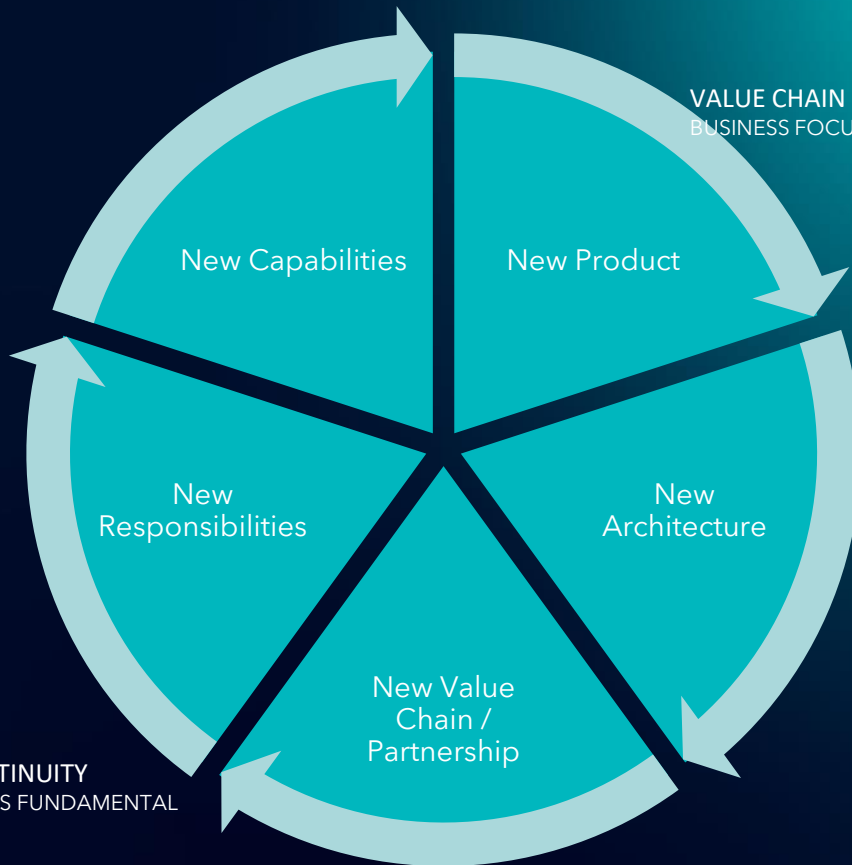
Future markets and  
customer needs

Digitalization

People and Skills

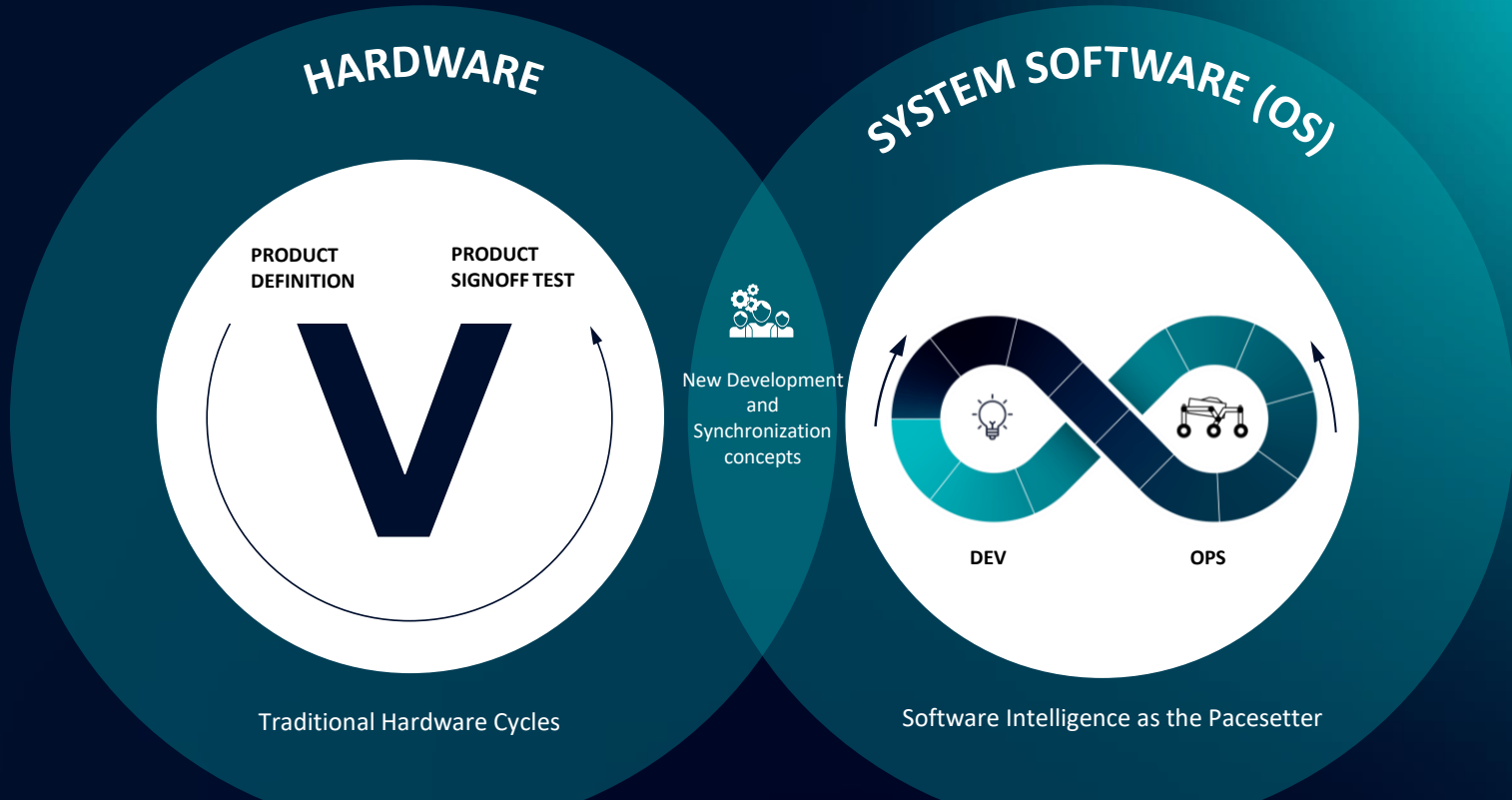
DIGITAL CONTINUITY  
TRACEABILITY AS FUNDAMENTAL  
CAPABILITY

VALUE CHAIN POSITIONING  
BUSINESS FOCUS



# Software in the Product

Hardware as enabling platform for a software added-value chain



Traditional Hardware Cycles

Software Intelligence as the Pacesetter

**The focus of standardization is shifting from the ability to industrialize hardware towards robust co-development and interaction between hardware and software of technical systems.**

→ We need to intensify efforts and know-how with respect to function based embedded software development for technical systems

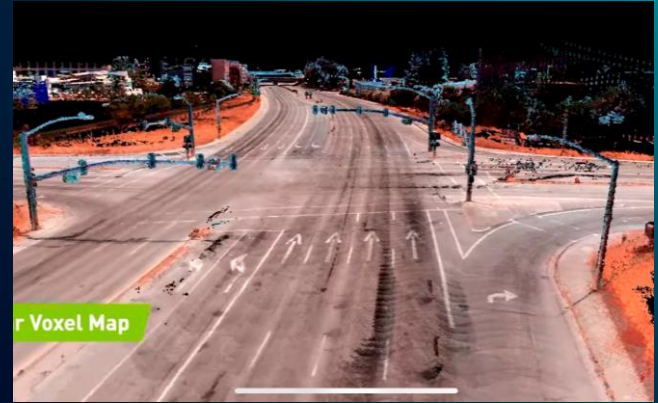
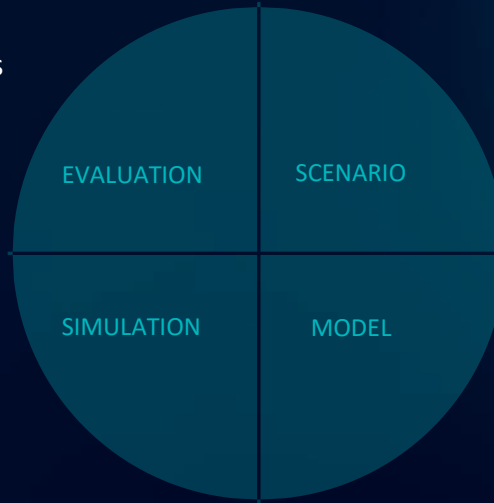


# Homologation / Certification

Virtual validation & verification for the homologation of highly complex systems

## CHALLENGES

- Rising Complexity of systems such as autonomous driving or ultimate load tests in aerospace
- Uncounted number of possible scenarios (physical prototypes excessive costs and lead time)
- Strong need to work with partners to safeguard everything – and with customers, yet as test drivers for new software in shadow mode, thus reducing the effort for testing



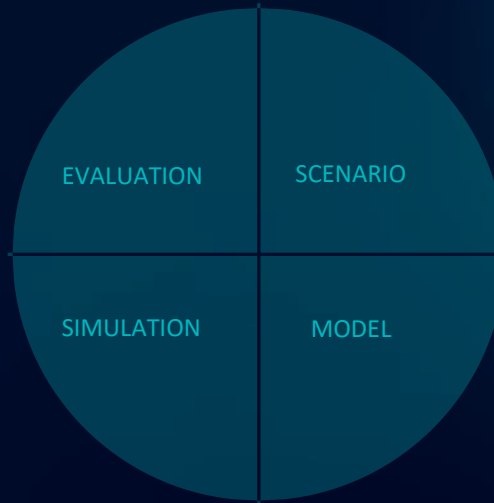
→ How to certify the safety of such systems?

# Homologation / Certification

Virtual validation & verification for the homologation of highly complex systems

## OPPORTUNITY

- Virtual testing as a complement of proof and mandatory part of regulations. Standards and legal frameworks for autonomous systems
- Simulation results becoming legally binding



→ As an industry consensus:

**Necessity to ensure the trustworthiness of virtual validation as test method for homologation in the long term!**

# People & Skills

Systems and integration mindset as enabler for future challenges





# prostep ivip Association

# PROSTEP IVIP AT A GLANCE

**30**  
years of  
excellence

**A strong community since 1993**

**Leading Worldwide-acting Neutral & Non-Profit Network**

180 Members from Manufacturing Industry, IT and Research

Driven & Funded by its Members

Know-how exchange in non-competitive areas

Sharing risks and funds, instead of doing it alone

Best practices, even beyond branches and continents

**Digital Transformer in Product Creation & Production**

Defining Standards & Interfaces for Digital Processes

Safeguarding industrial Benefits & Interoperability

**Expert in IT-Standards & Industrial Implementation**

# A strong community since 1993



# PROVIDING RESULTS OF INDUSTRIAL RELEVANCE FAST AND FLEXIBLE

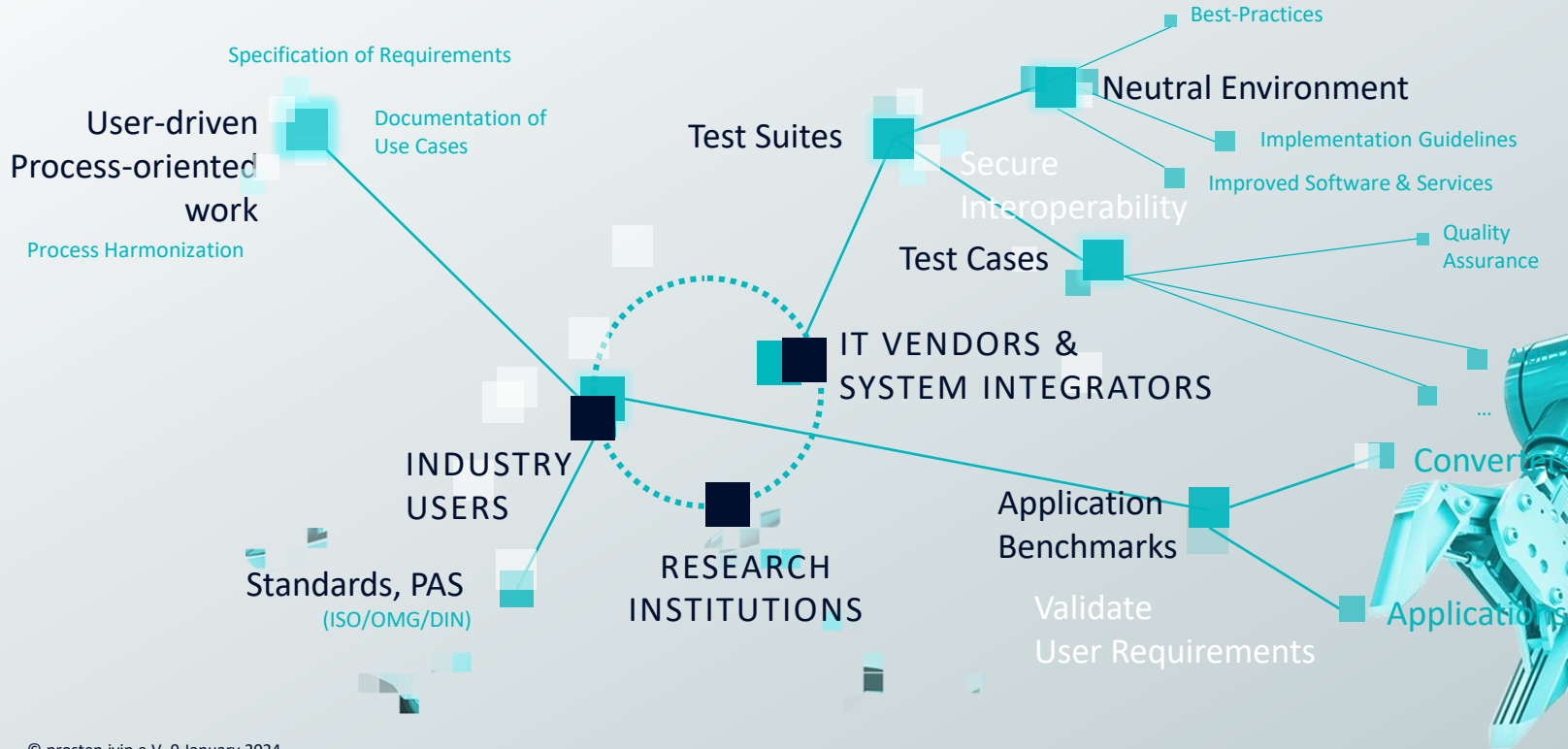
Defining Standards & Industrialization for Digital Transformation:

- e.g. ISO 10303 (STEP), ISO 14306 (JT), LOTAR, OMG ReqIF, Code of PLM Openness - DIN SPEC 91372
- Dozens of prostep ivip, VDA, VDMA Recommendations
- Tons of White Papers and Recommended Practices

Together with Partners to bring the relevant standard(s) to the market:



# PROSTEP IVIP – DIGITALIZATION, STANDARDS & NETWORKING







# Technical Work

# PROJECT CLUSTERS

1

## OPENNESS

Standardization Strategy Board (SSB)  
Code of PLM Openness (CPO)  
Ontologies

2

## INTERNATIONAL STANDARDIZATION

ISO 10303 (STEP AP242)  
ISO 14306 (JT)  
OMG ReqIF  
DIN SPEC CPO  
DIN SPEC JT

3

## PRODUCTION COLLABORATION

3D MDM@Cloud  
Cloud-based Production Collaboration



4

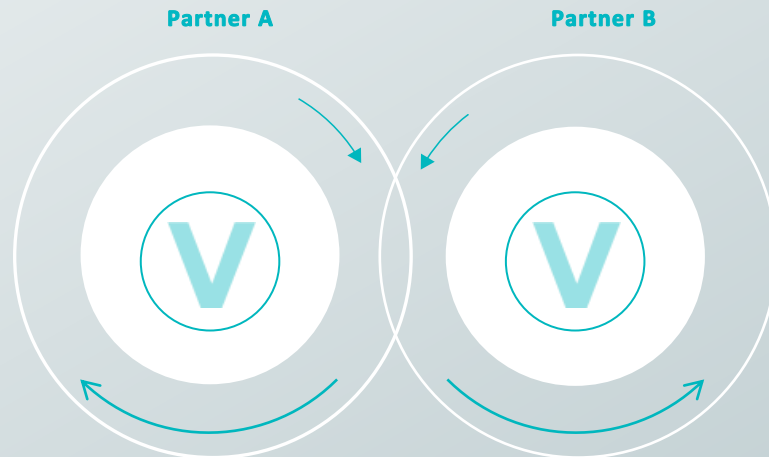
## DATA DRIVEN ENGINEERING COLLABORATION

Collaborative Digital Twin (CDT)  
Vehicle Electric (VEC)  
Requirements Interchange Format (ReqIF)  
Smart Systems Engineering (SmartSE)  
Functional Data Exchange (FDX)  
Jupiter Tesselation  
Digital Data Package (DDP)  
ECAD/MCAD  
MBx-Interoperability  
Long Term Archiving and Retrieval  
Project Schedule Management

# 3 DATA DRIVEN ENGINEERING COLLABORATION

Improving cross-domain and cross-company collaboration is the mission of the prostep ivip association.

We bundle user requirements, develop standards and make recommendations for collaboration in product development and production.



## FACTS

**17** Project groups

**70** members involved

International collaboration across **7** countries



# Strategic substance

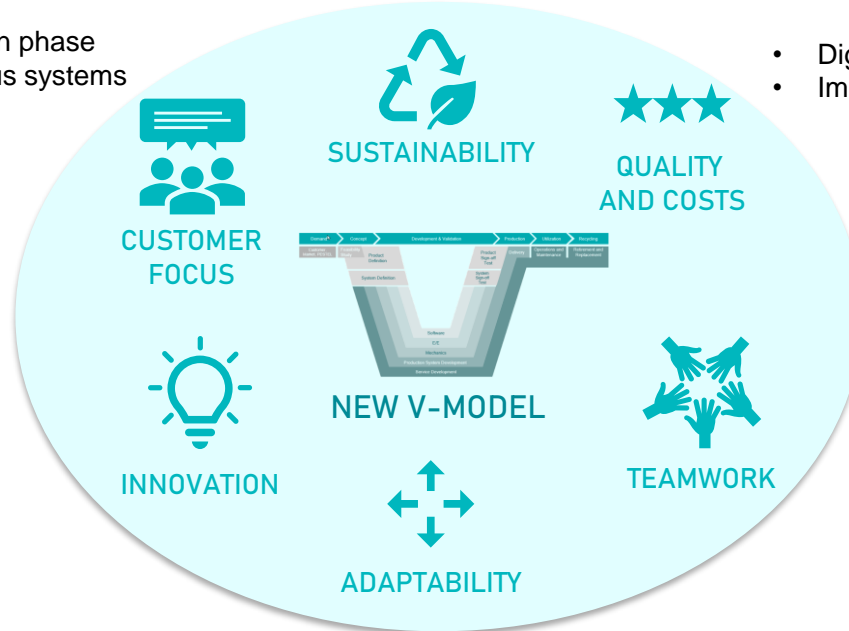
Towards SW-defined products

# Extension of the System-V Model – Business Drivers

- Circular Economy / Engineering
- Holistic view on product development, service and production system development

- Importance of product utilization phase
- Cyber-physical and autonomous systems
- IoT and AI technology

- Digital and Virtual Twin
- Importance of simulation

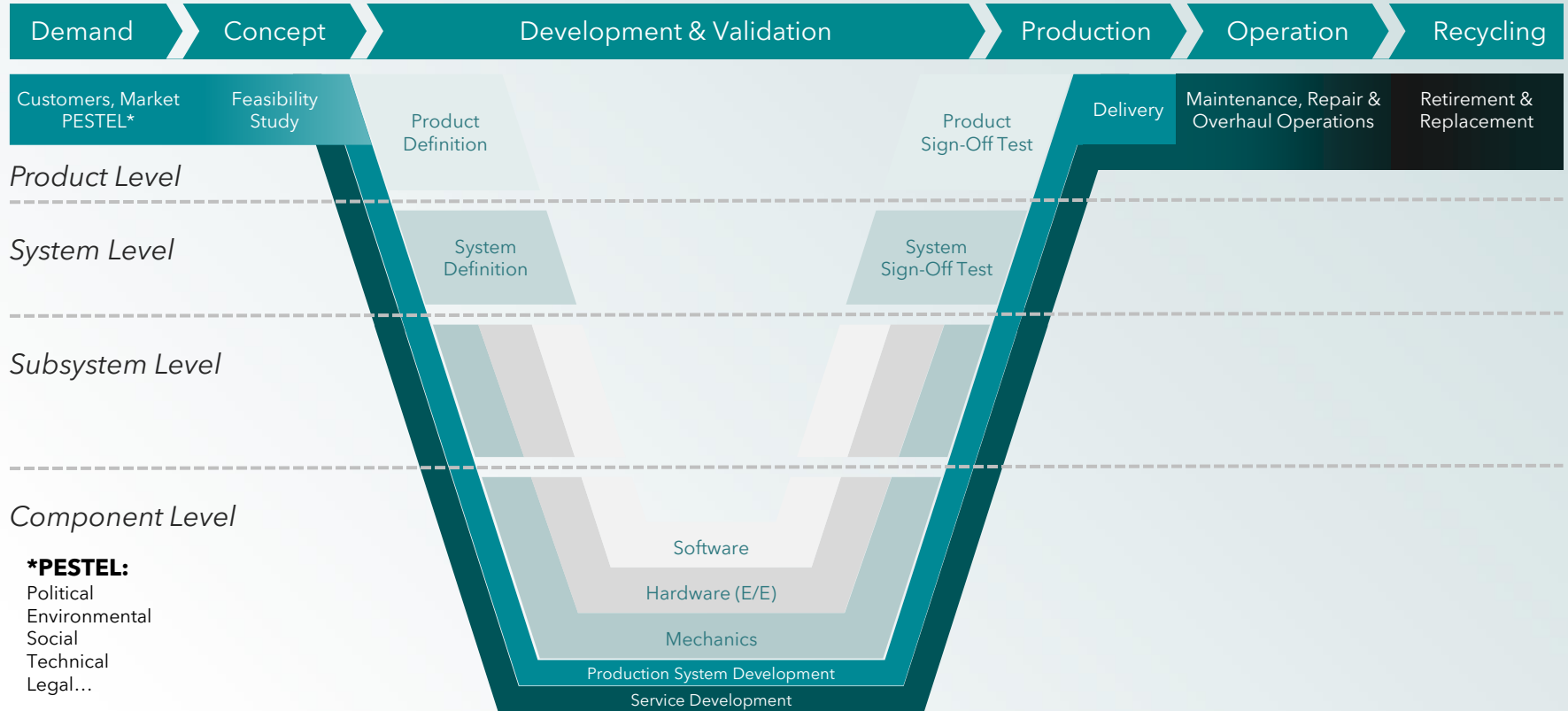


- Iterative and agile development throughout the product life-cycle

- Virtual collaboration between teams

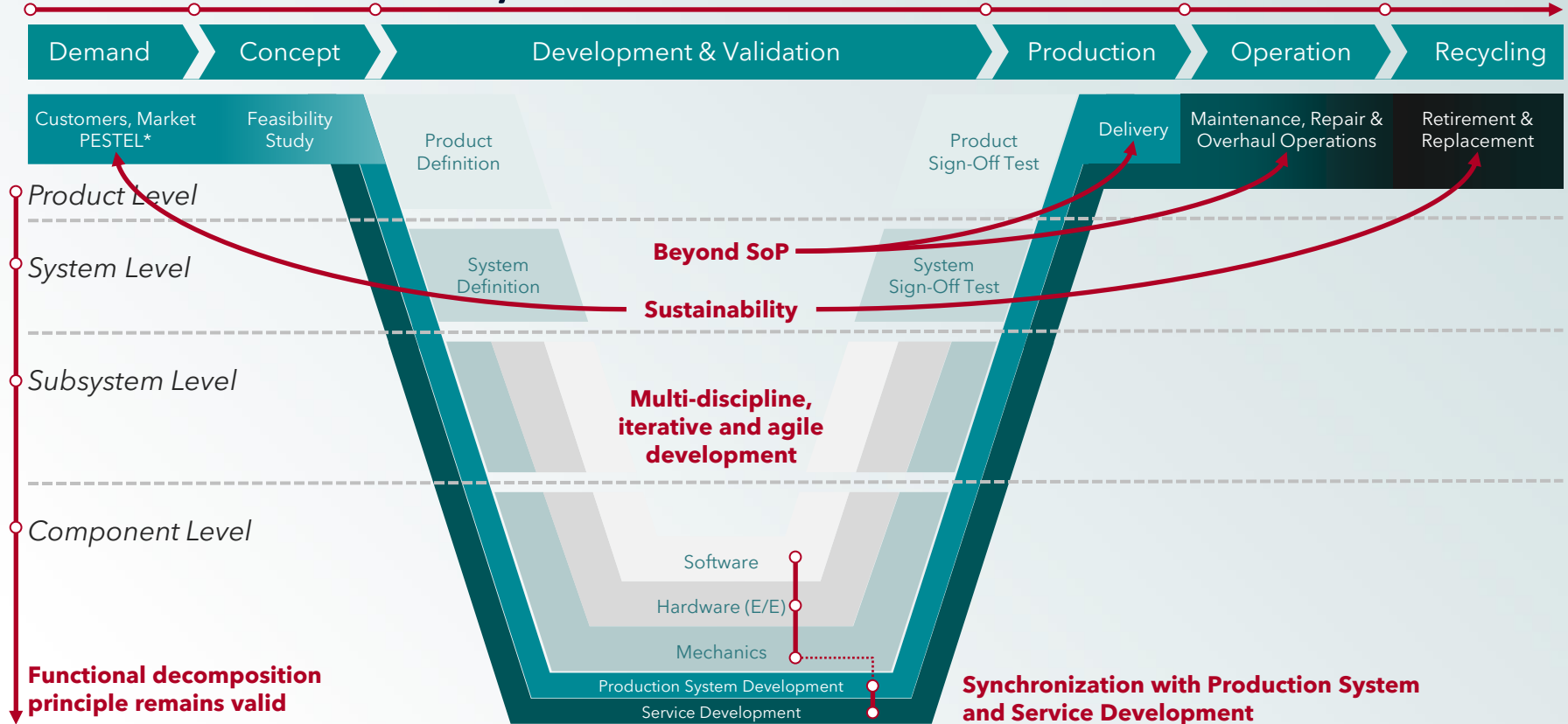
- Software-defined products
- Over-the-air updates / upgrades

# Extension of the System-V Model

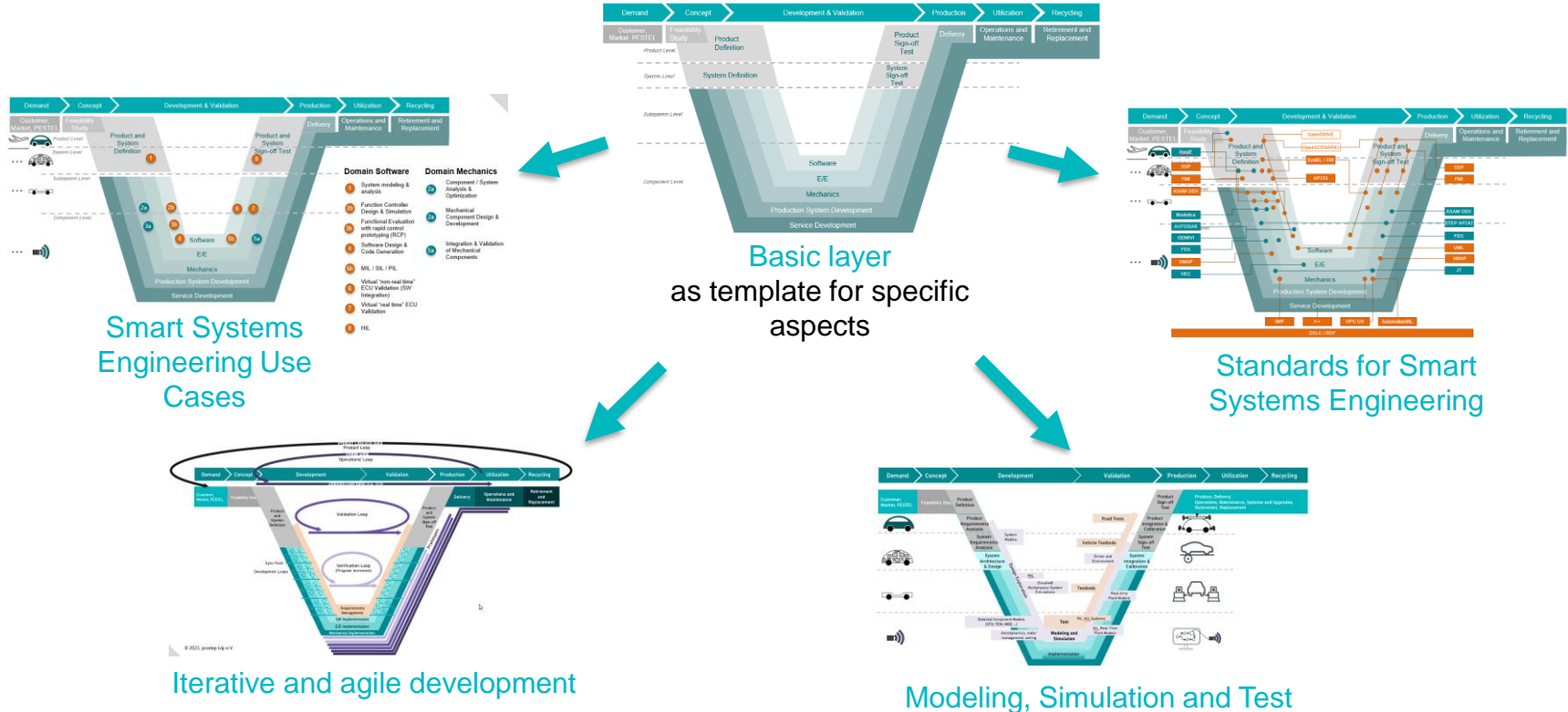


# Extension of the System-V Model

Consideration of the whole lifecycle



# Extension of the System-V Model: Overlay Concept



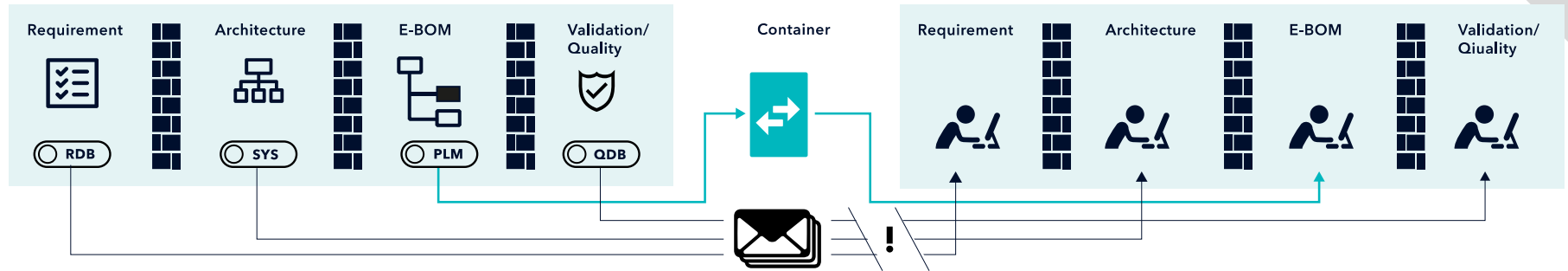


# Enabling cross-domain collaboration in MBSE – DDP

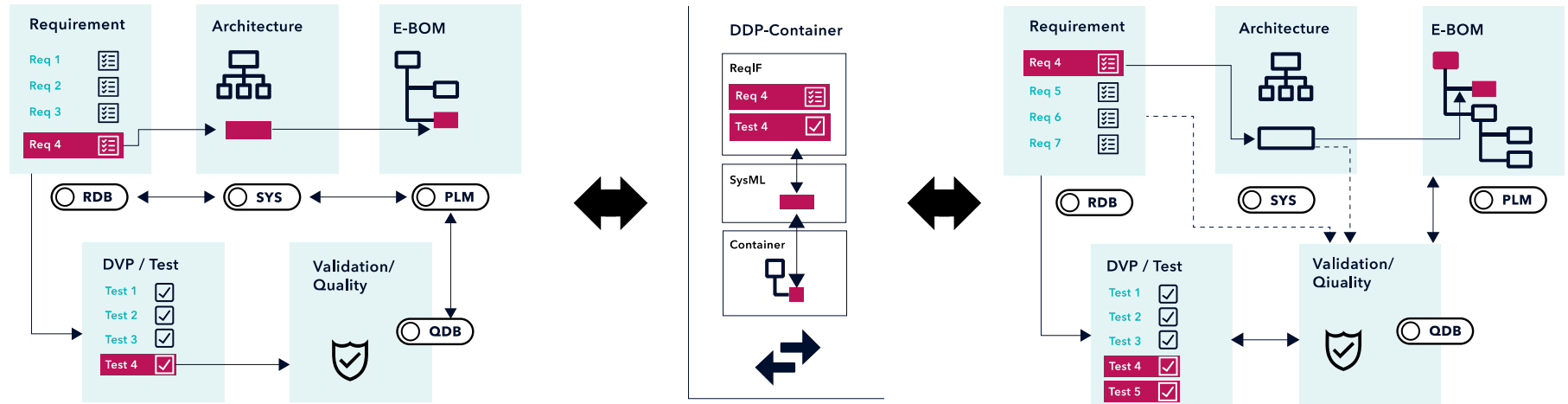
TODAY

Partner A

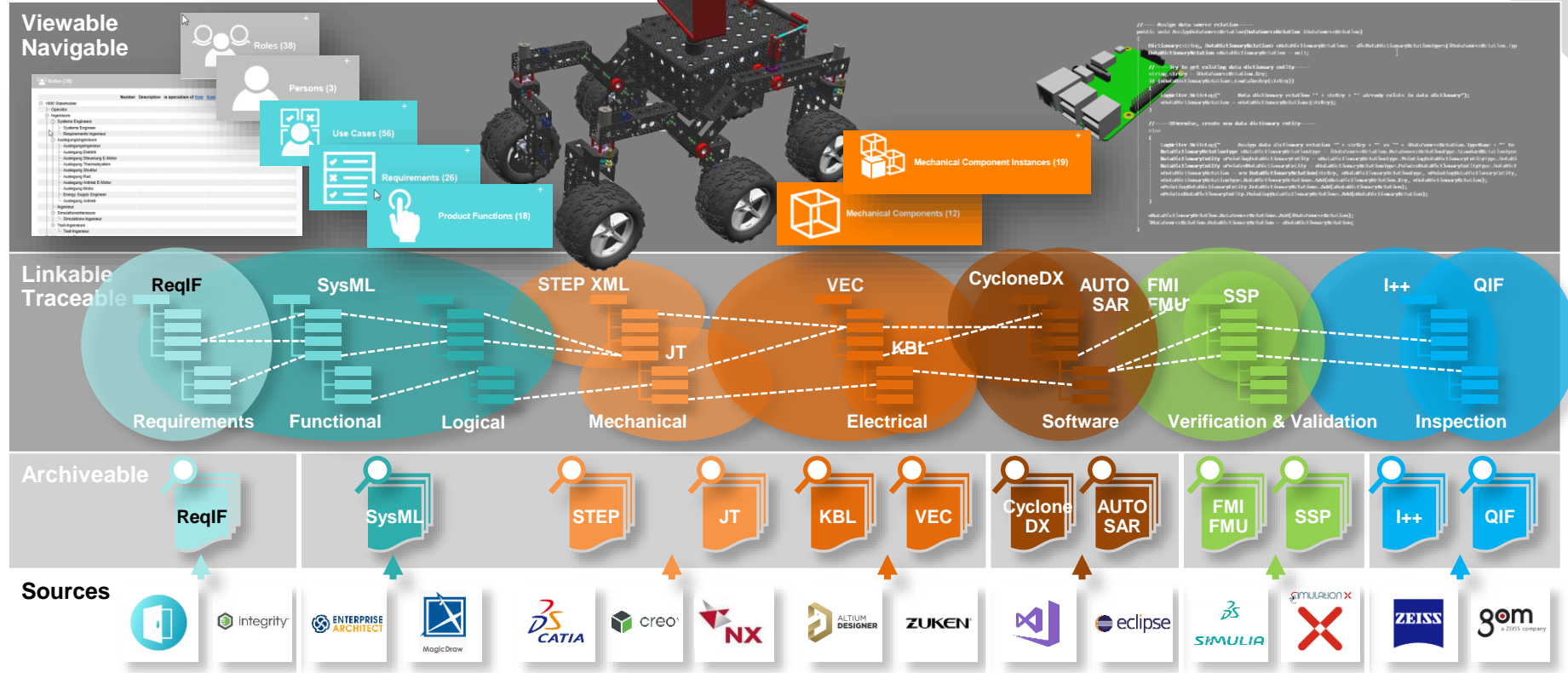
Partner B



TOMORROW

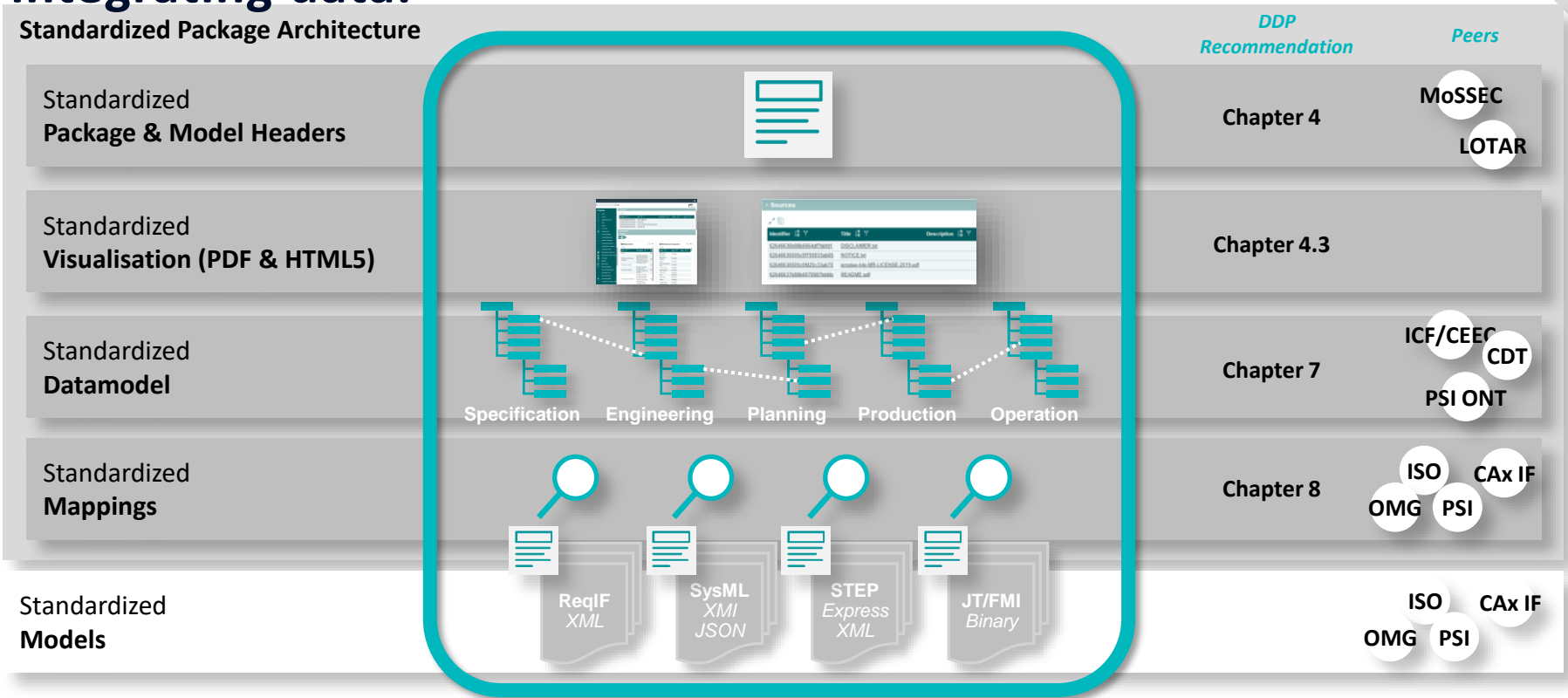


# Digital Data Package

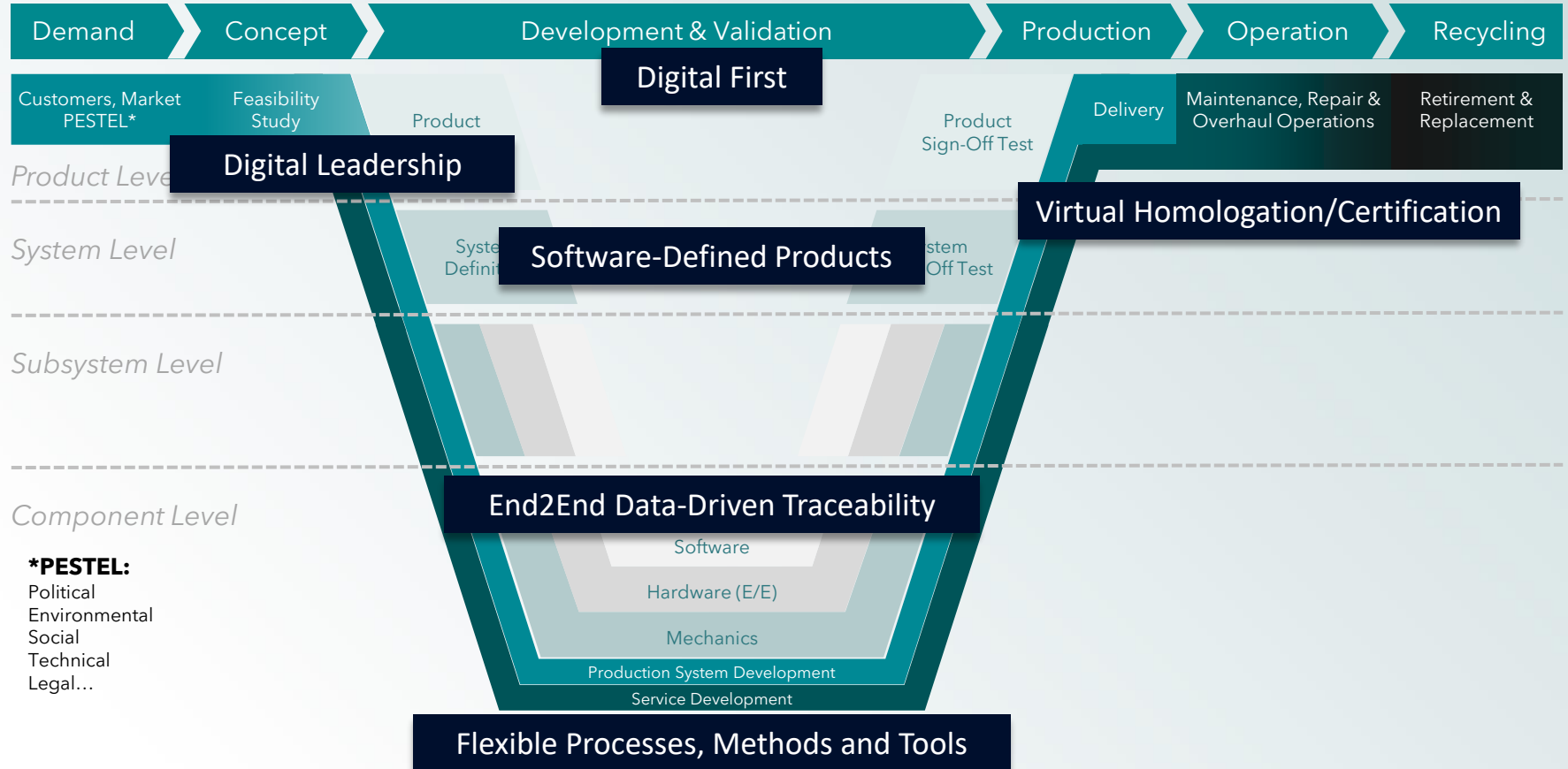


# Digital Data Package provides a standardized way of integrating data.

## Standardized Package Architecture



# Our fields of action



## Challenge - „Act Differently“

There are so many new issues that need solutions.  
Traditional methods or new approaches?

Legal Compliance

Sustainability

Change Management

# Management of Complexity

Efficiency

Performance

Software

Functional Safety

Regulations

Interdisciplinary  
Collaboration

Agility





Networking  
People



**Thank  
You!**



Success  
for you -  
and your  
company

